Charles T. Jahren

Continuation of Benchmark Project — Phase IV, 1999 Calendar Year

July 2000

Sponsored by the Highway Division Iowa Department of Transportation

Iowa Department of Transportation

Final

REPORT

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Department of Civil and Construction Engineering

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Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

ASTRACT

This is the final Report to the Iowa DOT Offices of Construction and the Highway Division for the calendar year 1999 research project entitled – Continuation of Benchmarking Project: Phase IV. This project continues efforts started in 1995 with the development of a performance measurement system. The performance measurements were used to identify areas that required improvement and process improvement teams (PITs) were launched to make recommendations for improvement.

This report provides a brief historical background, documents Benchmark Steering Team Activities, describes measurement activities including the employee survey and collection of non-survey data. Then a retrospective of past PIT activities is given, which sets the stage for the substantial increase in PIT activity that occurred during the winter of 1998/9. Finally, the report closes with suggestions for future directions in Benchmarking Activity.

INTRODUCTION

Background

This is the final report to the Iowa DOT Offices of Construction and the Highway Division (formerly called the Project Development Division) for the research project entitled – Continuation of Benchmarking Project: Phase IV. This project was initiated by the Offices of Construction of the Iowa DOT, which wanted to develop ways to measure the effectiveness of the organization's performance and practice continuous improvement. Included are all the construction offices, i.e., the Central Office in Ames, the six Districts (formerly called Transportation Centers), and the twenty Construction Residencies.

This project continues the efforts started in 1995. The Phase I project was entitled "Development of Benchmark Data for the Iowa Department of Transportation HR 381" (Chase, et al., 1996). The Iowa DOT Offices of Construction Benchmark Steering Team successfully developed a performance measuring system with the assistance of researchers from Iowa State University. The performance measuring system includes eight key processes: 1. Inspection of work; 2. Resolution of Technical Issues; 3. Documentation of Work Progress and Pay Quantities; 4. Employee Training and Development; 5. Continuous Feedback for Improved Contract Documents; 6. Provide Safe Traffic Control; 7. External/Public Communication; and 8. Providing Pre-letting Information) and between two and four performance measures for each process (See appendix A for a complete listing). It serves as the foundation for continuous improvement within the Offices of Construction.

During Phase I, two types of data were collected: baseline data and benchmark data. Baseline data represents the first collection of performance data for the Iowa DOT; they showed the status of the organization at that time. Future improvement or lack of improvement will be detected by comparing additional performance data with the baseline. Benchmark data were also collected; benchmark data are collected from organizations that perform similar functions and serve as a target for improvement (Chase, et. al 1996).
During Phase II, researchers continued to collect performance data and facilitated meetings of the Benchmark Steering Team. Researchers also assisted as the benchmark steering team launched statewide process improvement teams (PITs) to improve performance. (Federle and Jahren 1998).

Phase III focused on continuing the implementation process including an expansion of efforts to develop regional and local process improvement teams that would work on problems specific to a construction residency. Significant efforts were put forth in encouraging many more individuals within the offices to participate in the improvement process. (Federle and Jahren 1999)

Phase IV, the subject of this report, continued the focus on involving local and regional offices in continuous improvement, especially in participating in process improvement teams. The proposal for Phase IV was presented to the Highway Division in December of 1998.

As was true in previous efforts, the Benchmark Steering Team comprised a vertical slice of the Offices of Construction; Dr. Charles T. Jahren continued as the Principal Investigator, while Dr. Mark O. Federle served as the Co-Principal Investigator. Throughout Phase IV, monthly meetings of the Benchmark Steering Team continued with at lease one principal investigator acting as facilitators for the steering team.

Objectives

Phase IV was intended to provide proper support to construction residencies so they could launch their own quality improvement efforts. A second objective was to continue to measure the performance of the Offices of Construction using the previously developed framework (Phase I). The final objective of the project was to continue to provide facilitation support for the Benchmark Steering Committee.

Tasks

The following tasks were required to accomplish the objective:

1. Facilitate the Benchmark Steering Committee.
2. Assist in facilitating process improvement teams.
3. Prepare for Winter 1999/2000 process improvement activity.
4. Collect and analyze performance data
5. Write final report.

The following narrative describes continuous improvement activities in the Iowa DOT Offices of Construction during the 1999 Calendar Year.

BENCHMARK STEERING TEAM ACTIVITIES

The Benchmark Steering Team members included:

Tony Lazarowicz – District 3
Kevin Merryman – Des Moines Construction
Steve Staebler – Decorah Construction
Steve Ruddy – Mt. Pleasant Construction
Merle Kuhns – Cedar Rapids Construction
Ken Yanna – Cedar Rapids Construction
Warren Ihns – Davenport Construction

Wayne Sunday – Construction
John Smythe – Construction
Charles Jahren – Iowa State University

During the year, Dennis Erikson of Manchester Construction stepped down and Warren Ihns of Davenport Construction volunteered to serve as his replacement. Dr. Mark Federle of Iowa State University was also a member of the team until June, when he left Iowa State University to take a position with the Weitz Corporation. Both of their contributions were much appreciated.

About half of the meetings were in Ames and half of the meetings were in other locations.

Several activities were conducted during the meetings.

Review of PIT Team Progress – The Steering Team reviewed the progress of 13 process improvement teams and made suggestions to improve the studies or provide resources.

Review of Employee Survey Results – The Steering Team reviewed the results of the Offices of Construction Employee Survey and suggested appropriate improvement efforts.

Conduct Field Visits – Field visits were conducted to identify areas where past improvement efforts were successful and where further improvement is needed.

Act as a Process Improvement Team – The steering committee also acted as a process improvement team to develop better policies and procedures for handling field tile. In addition, this activity allowed the Steering Committee to develop empathy for the challenges faced by other process improvement teams and to lead by example.

Develop Topics for Winter 1999/2000 Improvement Efforts – Based on previously obtained information, the steering team developed suggested charters for winter 1999/2000 process improvement teams (Appendix B). Suggested Charters for the Winter 1998/1999 are also provided (Appendix C)

The Steering Team met in the following locations outside of Ames:

- Ottumwa (January)
- Cherokee (March)
- Des Moines (June)
- Decorah (July)
- Manchester (October)

This effort was expected to increase the amount of interaction between Benchmark Steering Team members and residency staff. At first, meetings were scheduled at the residency and no other activities were planned. This resulted in little interaction. Later, a set of field visits were added in conjunction with the meetings, and interaction increased substantially. The field visits were excellent opportunities for Steering Team Members to identify areas for improvement.

SURVEY RESULTS

A survey (Appendix D) was distributed to Offices of Construction Employees. The survey asks questions on each of the key functions that were selected when Continuous Improvement was starting. This survey was similar to employee surveys distributed in the three previous construction seasons. Out of over 400 employees, 182 responded. This was a substantial increase over the response from the previous year (113). The most recent survey was distributed in February and March of 1999, while the previous year's surveys were distributed in December and January. Waiting until later in the winter allowed speakers to stress the importance of completing the surveys during the regional winter meetings. Also, the later date may have allowed the field staff more time to close out the previous season's work so they could respond to the surveys with fewer distractions.

A comparison between this year's survey results and previous years' survey results showed few changes (Table 1). Taken together, the four surveys provide a baseline that can be used to compare with data that may be collected in the future. The key functions of Continuous Feedback for improved contract documents and providing pre-letting information received the lowest ratings. Employee training and development received the highest ratings. The data was also sorted and analyzed regionally. Few regional differences were identified (Table 2).

Table 1. Offices of Construction Employee Survey

Offices of Construction Employee Survey	AVERAGE 1995	AVERAGE 1996	AVERAGE 1998	AVERAGE 1999
Years in DOT	Not asked	Not asked	18.43	19.07
Inspection of work				
Clarity of duties	3.77	3.74	3.62	3.66
Understanding rior to duties	3.81	3.77	3.64	3.60
Inspection process influence final quality	3.43	3.37	3.45	3.46
Amount duplication of effort in paperwork	2.59	2.63	3.07	2.78
Amount nonproductive activity during inspection	2.94	3.46	3.54	3.4
Overall quality of inspection	3.37	3.35	3.45	3.30
Resolution of Technical issue				
Confidence to supervisor support	3.59	3.57	3.39	3.44
Communication within Iowa DOT offices	3.13	3.18	3.26	3.23
Communication with contractors	3.25	3.25	3.3	3.25
Timeliness of resolution	2.74	3.01	2.99	2.82
Amount of non productive activity	2.74	3.15	3.23	3.04
Overall quality of the resolution process	2.89	3.1	3.12	3.10
Provide safe traffic control				
Contractors' knowledge	3.05	3.24	2.85	2.92
Contractor concern	2.73	2.78	2.43	2.44
Quality of plans and specification	3.51	3.49	3.55	3.75
Overall quality	3.33	3.42	3.28	3.06
Documentation of work progress and pay				
Amount of time spent	3.25	3.35	3.25	3.03
Percentage of time spent			31.87	33.03
Amount of duplication effort	2.77	3.05	3.54	2.99
Amount of non productive activity	3.02	3.29	3.43	3.28
Overall quality	3.23	3.25	3.33	3.02

Table 1 (continued). Employee Survey Results.

Offices of Construction Employee Survey (Continued)	AVERAGE 1995	AVERAGE 1996	AVERAGE 1998	AVERAGE 1999
Employee training and development				
Ability to do the job	3.8	3.78	3.78	3.81
Benefit of classroom training and development	3.4	3.42	3.53	3.47
Benefit of on-the-job training	3.69	3.9	3.73	3.86
Application of training in work	3.51	3.36	3.64	3.59
Ability to request a training	3.23	3.42	3.53	3.65
Ability to obtain a training	3.03	3.15	3.23	3.42
Scheduling of training sessions	2.81	2.92	3.18	3.10
Overall quality of training	3.24	3.18	3.42	3.53
Continuous feedback for improved contract document				
Clarity of instruction	not asked	2.74	2.72	2.62
Level of satisfaction on "time allotted to get info"	not asked	2.41	2.45	2.21
Responsiveness of Iowa DOT to plan review question	not asked	2.87	2.7	2.60
Opportunity to make suggestions	not asked	2.97	2.74	2.77
Responsive to your suggestions	not asked	2.79	2.54	2.47
Number of repeat problems	not asked	3	2.61	2.66
Overall quality of the process	not asked	2.76	2.74	2.62
Providing Pre-letting information				
Level of satisfaction of question why info needed	3.34	3.43	3.29	3.20
Clarity of instruction	3.2	3.23	3.15	3.03
Level of satisfaction on "time allotted to get info"	2.69	2.72	2.8	2.68
Level of satisfaction on "feedback I receive"	2.42	2.56	2.54	2.50
Level of satisfaction on "define procedures"	2.8	2.8	2.81	2.76
Overall quality of pre-letting process	2.85	2.86	2.87	2.74
Has the pre-letting process improved			3.16	

Table 2. Survey Results by District.

Offices of Construction Employee Survey 1999	AVERAGE FOR DIST. 1 (CITC)	AVERAGE FOR DIST. 2 (NEITC)	AVERAGE FOR DIST. 3 (NWITC)	AVERAGE FOR DIST. 4 (SWITC)	AVERAGE FOR DIST. 5 (SEITC)	AVERAGE FOR DIST. 6 (ECITC)	AVERAGE FOR OTHER	GRAND AVERAGE
Years in DOT	21.94	17.96	18.03	19.00	29.60	25.24	16.40	19.07
Inspection of work								
Clarity of duties	4.00	3.72	3.75	3.38	3.65	3.94	3.56	3.66
Understanding your to duties	4.00	3.72	3.63	3.63	3.75	3.94	3.44	3.60
Inspection process influence final quality	3.65	3.71	3.00	3.43	3.83	3.76	3.33	3.46
Amount duplication of effort in paperwork	3.06	3.28	2.38	2.75	2.78	2.88	2.67	2.78
Amount nonproductive activity during inspection	3.82	3.07	3.25	3.17	3.33	3.65	3.37	3.40
Overall quality of inspection	3.50	3.13	3.19	3.07	3.35	3.47	3.29	3.30
Resolution of Technical issue								
Confidence to supervisor support	4.06	3.28	3.63	3.25	3.78	3.47	3.34	3.44
Communication within Iowa DOT offices	3.71	3.18	3.57	3.00	3.33	3.59	3.07	3.23
Communication with contractors	3.65	3.47	3.00	3.57	3.11	3.29	3.14	3.25
Timeliness of resolution	3.53	3.00	2.86	2.25	2.89	2.94	2.69	2.82
Amount of non productive activity	3.76	2.76	3.00	2.71	2.78	3.18	2.98	3.04
Overall quality of the resolution process	3.76	3.06	3.33	2.63	3.00	3.41	2.98	3.10
Provide safe traffic control								
Contractors' knowledge	3.06	2.60	3.38	3.07	3.11	2.88	2.88	2.92
Contractor concern	2.82	2.13	2.25	3.14	2.44	2.44	2.39	2.44
Quality of plans and specification	3.82	3.38	3.75	3.43	3.05	3.38	3.96	3.75
Overall quality	3.29	3.06	3.38	3.29	2.89	2.94	3.01	3.06

Table 2 (continued). Survey Results by District.

Offices of Construction Employee Survey 1999	AVERAGE FOR DIST. 1 (CITC)	AVERAGE FOR DIST. 2 (NEITC)	AVERAGE FOR DIST. 3 (NWITC)	AVERAGE FOR DIST. 4 (SWITC)	AVERAGE FOR DIST. 5 (SEITC)	AVERAGE FOR DIST. 6 (ECITC)	AVERAGE FOR OTHER	GRAND AVERAGE
Documentation of work progress and pay								
Amount of time spent	3.07	3.50	3.14	3.14	3.57	3.08	2.87	3.03
Percentage of time spent	32.50	32.00	48.33	52.50	26.86	37.69	30.54	33.03
Amount of duplication effort	3.27	3.38	2.57	2.43	2.63	3.25	2.96	2.99
Amount of non productive activity	3.53	3.60	3.29	2.86	3.63	3.43	3.16	3.28
Overall quality	3.00	3.20	3.57	2.50	3.50	3.27	2.91	3.02
Employee training and development								
Ability to do the job	3.82	3.83	3.75	4.00	4.10	4.18	3.70	3.81
Benefit of classroom training and development	3.53	3.61	3.63	3.63	3.60	3.81	3.34	3.47
Benefit of on-the-job training	4.00	4.00	3.50	4.13	4.00	3.53	3.86	3.86
Application of training in work	3.53	3.61	3.75	3.75	3.90	3.88	3.49	3.59
Ability to request a training	4.00	3.59	4.13	3.50	3.60	4.06	3.52	3.65
Ability to obtain a training	3.76	3.35	4.00	3.38	3.60	3.94	3.24	3.42
Scheduling of training sessions	3.29	2.89	3.75	3.43	3.15	3.38	2.99	3.10
Overall quality of training	3.71	3.56	4.00	3.88	3.55	3.75	3.39	3.53
Continuous feedback for improved contract document								
Clarity of instruction	2.88	2.60	2.50	2.29	2.94	2.88	2.54	2.62
Level of satisfaction on "time allotted to get info"	2.25	2.40	2.25	1.43	2.30	2.50	2.18	2.21
Responsiveness of Iowa DOT to plan review question	3.00	2.79	2.67	1.80	2.50	2.75	2.52	2.60
Opportunity to make suggestions	3.00	2.93	2.29	2.00	2.56	3.07	2.77	2.77
Responsive to your suggestions	2.84	2.43	2.17	1.83	2.38	2.73	2.44	2.47
Number of repeat problems	3.00	2.86	2.38	2.33	2.67	2.81	2.60	2.66
Overall quality of the process	2.88	2.93	2.50	2.17	2.44	2.47	2.60	2.62
Providing Pre-letting information								
Level of satisfaction of question why info needed	3.59	3.29	3.57	3.00	3.33	3.20	3.08	3.20
Clarity of instruction	3.35	3.06	3.50	2.80	3.00	3.13	2.91	3.03
Level of satisfaction on "time allotted to get info"	2.76	2.76	3.13	2.40	2.57	2.67	2.64	2.68
Level of satisfaction on "feedback I receive"	2.88	2.35	2.43	2.20	2.43	2.60	2.47	2.50
Level of satisfaction on "define procedures"	2.94	2.88	3.40	2.20	2.57	2.93	2.68	2.76
Overall quality of pre-letting process	2.97	2.88	3.33	2.40	2.14	2.87	2.67	2.74

Written comments (Appendix E) indicated several areas of concern:

Work Load and Time Issues – Several survey respondents expressed concern about heavy work loads and having insufficient time inspect construction operations. Discussion with Benchmark Steering Team members indicated that in some cases, considerable time is spent educating contractor personnel who are marginally qualified for the work.

The following action items were developed in response to these concerns.

- John Smythe worked with a study group that defined areas where contractors can take additional responsibility for quality control.

- John Smythe reminded residency personnel that they should enforce Specification Section 1105.05, which requires contractors to provide competent superintendents.

- The Benchmark Steering Committee encouraged PITs to address issues that will increase the efficiency of inspection.

- A workshop was held during February 2000 to identify best practices and desired improvements with regard to inspection of selected items.

Plan Errors and Problems with Plans –Several survey respondents also noted problems with plans. Consultant produced plans are sometimes especially difficult because consultants may not be aware of Iowa DOT conventions. This is especially true with pay items because consultants may not know what is a pay item and what is incidental. It may be possible to improve the plans by providing pre-letting field information in a standard format. Patch tabs are an example of information that has been standardized. Other information to consider for standardization includes edge rut removal, strengthening and leveling, and pipe extensions.

It is challenging to provide good plans for MP and 3R projects. Some of these projects are more complicated because new construction must fit with old construction or because it is difficult to develop a standard format.

- A PIT Team was meeting with representatives from the Consulting Engineers Council, FHWA, AGC/I and Iowa DOT. John Smythe interfaced with the team and presented concerns on behalf of the Office of Construction.

- Decorah Residency was working to standardize their methods of gathering pre-letting information. This study was completed during the winter of 1999/2000 and is currently available.

Computer Training – Survey respondents indicated a desire for more computer training. Some of the comments were for FieldBook and other programs that are specific to the Offices of Construction. However, it seems likely that many of the comments could be addressed with general computer training such as MS Windows and Office. Such training is available from several sources:

- Off site Iowa DOT classes
- Off site vendor classes
- On site classes (would be possible to arrange for an entire residency)
- Computer courses that can be downloaded from the LAN.

Offices of Construction Supervisors were advised to make use of such resources.

NONSURVEY DATA

Non-survey data were collected from Offices of Construction records includes information related to inspection costs, litigation cases and payouts, average time from project acceptance to final payment, cost overruns as a percent of contract volume, and number of accidents. These items were identified in Phase I as measures for certain key functions. It is likely that the number of dollars of work accomplished influences most of these measures. Figure 1 shows the dollar volume of work accomplished since 1994.

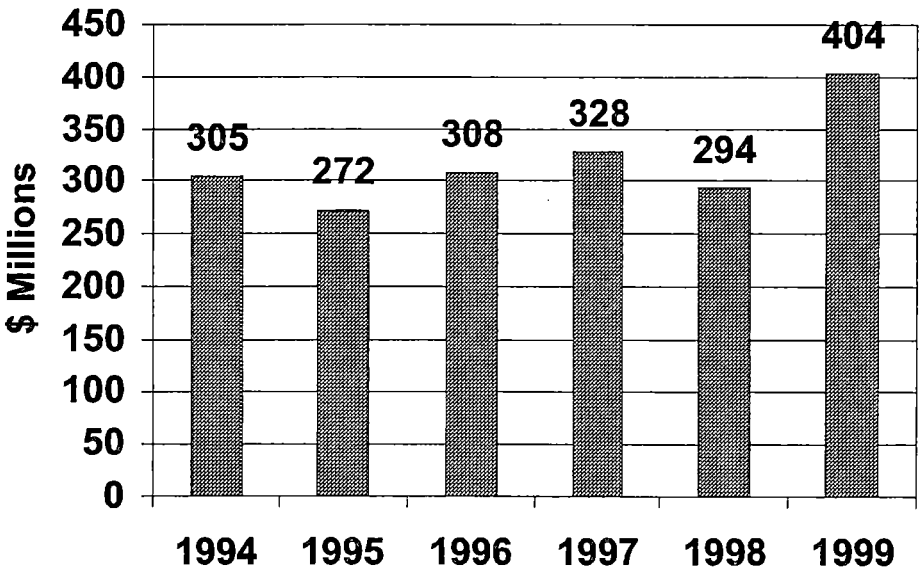

Figure 1. Work Accomplished

The most recent data available for each are provided below along with historical comparisons.

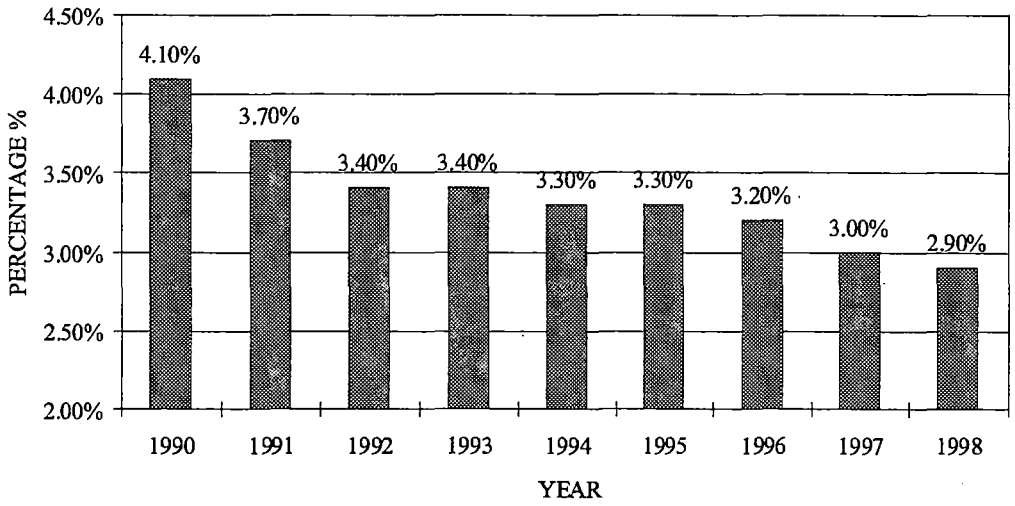

Figure 2. Cost of Inspection as a Percentage of Contract Volume.

Inspection Costs

The inspection costs, as a percentage of contract volume, is a measure for the key function *inspection of work.* This measure dropped every year until 1998 (Figure 2). These costs are expected to rise in 1999 because more effort was required to inspect the increased amount of work accomplished. Direct costs are salaries and expenses charged to a specific project.

Litigation

The number of cases litigated is a measure of the key function *Resolution of Technical Issues.* This only includes cases involving contract administration, not personal injury or civil rights. One case involving contacts was litigated in 1999. This compares with previous years as follows:

- 1993: 0
- 1994: 0
- 1995: 1
- 1996: 3
- 1997: 0

- 1998: 1
- 1999: 1

Litigation Payout

Litigation payout is also a key measure for the key function *Resolution of Technical Issues.* No claims were paid in 1999. This compares with previous years as follows:

- 1993: $ 0
- 1994: $ 0
- 1995: $ 0
- 1996: $ 92,800
- 1997: $ 0
- 1998: $ 0
- 1999 $ 0

Time to Project Closeout

Offices project closeout times (time from project acceptance to final payment), are a measure for the key function *Work Progress and Pay Quantities.* The number of days increased in 1999 (Figure 3). This was due to successful efforts to close out a number of projects that had been open for extended periods as well as health problems of employees responsible for this task.

Cost Overruns

Poor quality contract documents may cause cost overruns. Improving feedback to DOT personnel should reduce the amounts of cost overruns on projects by increasing the quality of the contract documents. Cost overruns may include (Chase, et al. 1996):

- Change orders - changes to existing contract items which require management authorization,
- Extra work orders - newly created contract items which require management authorization, and
- Overruns / underruns - changes in contract quantities that result in higher or lower contract costs.

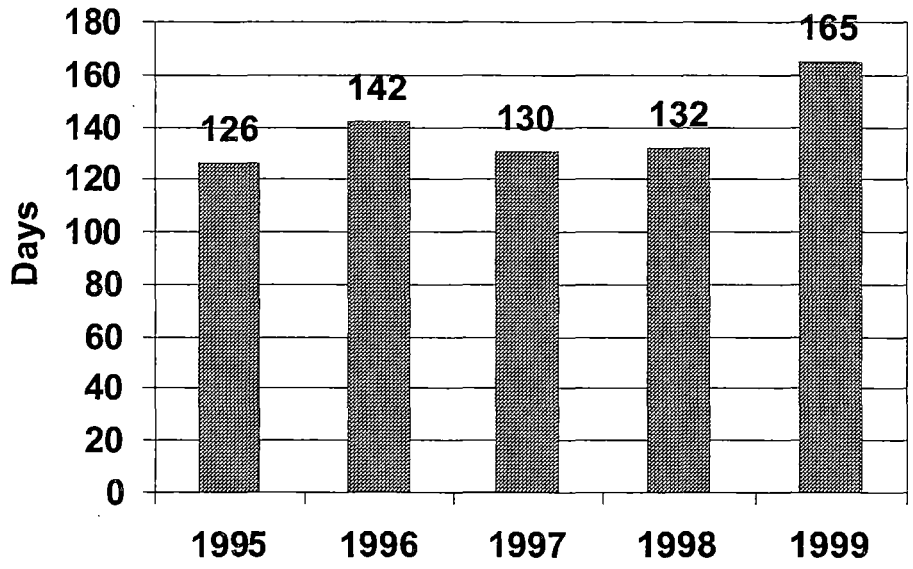

Figure 3. Closeout Time (Days)

Therefor, this measure is associated with the key function *Continuous Feedback for Improved Contract Documents.* At the time this report was finished, 1998 and 1999 data were not available. The data for recent years are as follows:

- 5.16% in 1999
- 5.09% in 1998
- 4.43% in 1997[1]
- 4.72% in 1996
- 4.93% in 1995
- 3.77% in 1994
- 4.68% in 1993

This is also shown graphically in Figure 4.

[1] This percentage does not include a payout of an additional 1.63% which overwhelmed the statistics with this outlier of cost overruns. For that reason it was excluded from the information presented above.

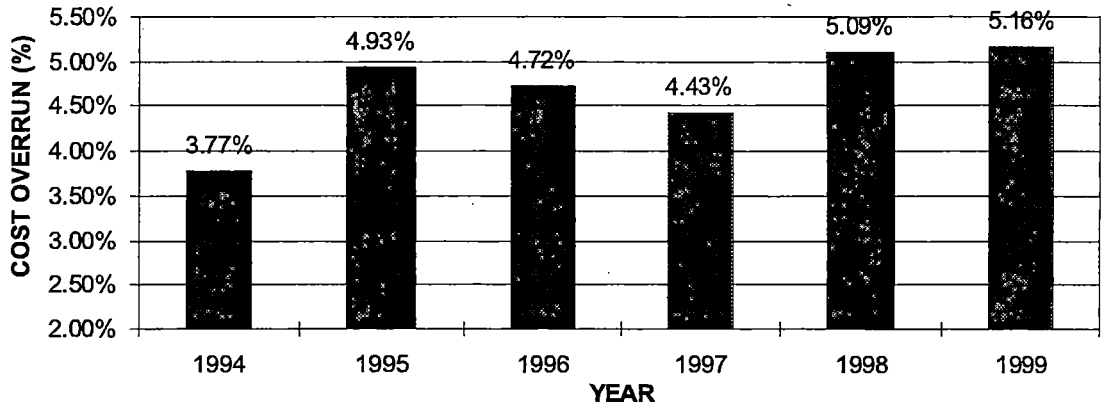

Figure 4. Cost Overruns, as a Percent of Contract Volume

Numbers of Accidents in Construction Work Zones

The number of accidents in work zones is a measure for the key function *Provide Safe Traffic Control.* Accident information is slow coming out; however, the following data are available (Figure 5):

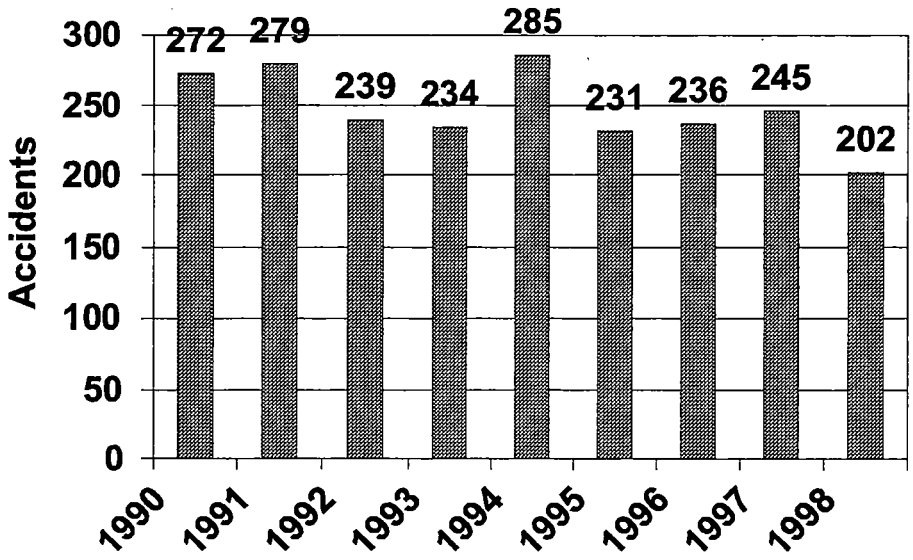

Figure 5. Number of Accidents Reported

These items comprise the non-survey data that the Offices of Construction uses to measure its performance. The steering team receives this information and uses it to guide its decision making process.

PROCESS IMPROVEMENT TEAM RETROSPECTIVE

During the last four winter seasons the Benchmark Steering Team has charged process improvement teams (PITs) with the challenge of recommending strategies for improvement. During the fourth winter season (1998/1999), 14 process improvement teams were active, a substantial increase above previous season (Figure 6). Figure 7 shows the context within which this increase of activity took place. Initially the foundation for continuous improvement were set. This included 1) appointing a steering team, 2) writing a mission statement, 3) selecting key functions, 4) identifying customers, and 5) developing a performance measuring system. Performance measurement has continued since the foundations for the continuous improvement system were laid. The first PITs were recruited and operated on a statewide basis. Although, these teams were successful, it became apparent that the travel demands caused by such efforts would limit their efficiency. An initiative was started to launch local and regional teams to increase participation and increase ownership in the results. The following narrative describes PIT activities in the Iowa DOT Offices of Construction.

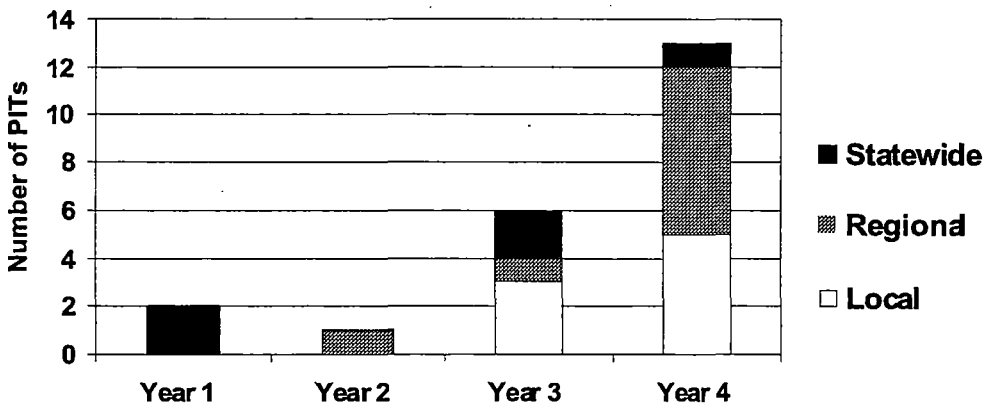

Figure 6. Number of PITs per year

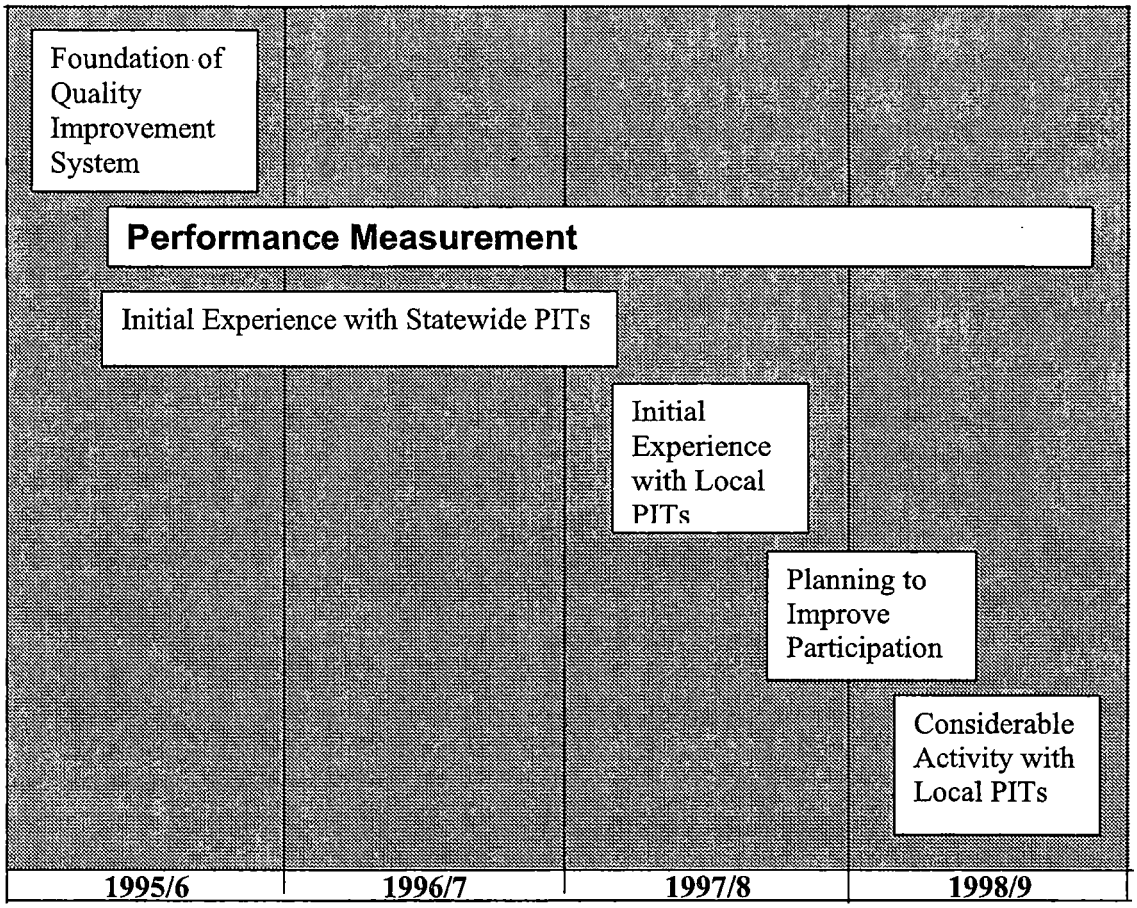

Figure 7. History of Quality Improvement and PITs

Early Process Improvement Efforts

Process improvement efforts started tentatively with PITs in the winter of 1995/6. The winter season has been selected for process improvement efforts because there is less competition for time from construction activities. PIT members were selected by the Steering Team from employees who indicated a willingness to participate in the performance measurement survey. The Steering Team provided charters for the teams to study two key functions that required improvement: *Resolution of Technical Issues* and *Providing Pre-Letting Information*. The former PIT classified technical issues into categories. Their efforts helped to focus attention on the need to resolve technical issues so that more effort was placed on this subject during staff meeting. The latter team developed a computer aid to assist in tracking the status of pre-letting information requests. Both teams were assisted by trained facilitators from the Iowa DOT staff.

In the winter of 1996/7 one PIT was launched, which made recommendations to increase contractor concern for traffic control. Members were selected by using the method from the previous year. Previous PIT members expressed concern about the travel requirements for participating in statewide PITs. Therefore this team was set up as a regional team that met in Eastern Iowa. This PIT recommended requiring the contractor to provide a traffic control supervisor on jobs with heavy traffic control requirements, evaluating contractors separately on their traffic control activities, and coordinating non-compliance penalties on a state-wide basis. Their recommendations were implemented on a pilot bases.

Although the previously describe teams were successful, the Steering Team wished to increase the amount of process improvement activity without interfering with other required activities. In the winter of 1997/8, the Steering Team encouraged residencies to form their own process improvement teams on subjects of their choice. The writers offered their services as facilitator. Teams were encouraged to select topics of limited scope to increase the probability for success. Changes to specifications and contract documents that would ease the resolution of technical issues or increase inspection efficiency were emphasized. This initiative had several advantages. It allowed employees to work with familiar people and limit travel. It also took advantage of local leadership and allowed team members to take on challenges that were burning issues for their work group.

Inspectors from the Jefferson Residency offered to improve measurement and payment provisions for crack sealing. At the time, crack filling was paid by length and there were five classes of cracks. Inspectors spent most of their time measuring cracks at a location that was far removed from the actual crack sealing work. The RCE facilitated the PIT with additional assistance from the first author and the State Construction Engineer. Work commenced without team building activities. Team members studied the existing processes and identified stakeholders. Then they found how neighboring state DOTs approached these issues and brainstormed to develop a list of alternatives. Next, they interviewed all stakeholders to assess the acceptability of various solutions. Finally, they recommended changes. These recommendations were presented to the Iowa DOT Specifications Committee and accepted. The pay quantity for crack sealing is now the pound of sealant and inspectors are able to watch the work. The results of this effort exceeded the expectations of all involved. Team members were gratified that they were able to make a difference!

Meanwhile other, local, regional and statewide process improvement efforts continued: One residency was involved in an experiment to transfer asphalt and concrete plant inspection responsibilities from the Office of Construction to the Office of Materials. They develop a checklist of tasks that could be overlooked during the transfer and made recommendations as to how to prevent such difficulties. Another residency opted to form a self-directed work group to update a road inventory that is used to allocate funds from the road use tax fund. A regional group from East Central and Northeastern Iowa reviewed standard plans for field fences

and clarify requirements. They developed preliminary recommendations after interviewing fence contractors and fence suppliers and finished the project during the following winter season. Statewide teams reviewed procedures for using notebook computers to track quantities and authorize payments. They flowcharted the entire process and recommended several improvements. The Steering Team made a commitment to act as a PIT so they could develop empathy for the PITs that reported to them. Technical issues involving concrete patching were selected as the topic. The team recounted their own experience and those of colleagues and found that most technical issues arose because the standard drawings did not clearly state the geometry of the patch in various situations nor the location of dowel bars and tie bars. A patching fact sheet was developed and distributed.

Increased Process Improvement Activity

The Steering Team was pleased with the results of the PIT activities; however, it was disappointed that there was not wider participation, especially at the residency level. There are a number of likely reasons for the low participation. First, the concept was proposed to the residencies in November. It was a new concept that had not been tested. There were questions about how to form a PIT, how to select a topic, how to conduct an investigation, and what are reasonable expectations for results. By the time these concerns were addressed, most of the winter had passed and the residencies were preparing for spring work.

In response, the Steering Team developed a set of pro-forma charters (Appendix C) that could be shared with prospective PITs to assist them in the process of selecting topics. These pro-forma charters also outlined what the Steering Team considered to be a reasonable scope of work. Then the State Construction Engineer met with the six District Construction Engineers (DCEs) to encourage the formation of PITs at the district and residency level. DCEs were asked to meet with Resident Constructions Engineers (RCEs) to explain the request and to plan PIT activities. The RCEs were asked to request volunteers to join the teams and select topics for study. Although no specific guidelines were given about how to form the teams, assurance were given that facilitation would be provided on request by the writers and other trained facilitators on the Iowa DOT staff. The study performed by the Jefferson Residency was held out as an example of what could be accomplished by a process improvement team.

Thirteen process improvement activities took place during the winter of 1998/9. Teams were formed in a variety of ways and they studied a variety of topics. Although the groups referred to the pro-forma charters as they selected their topics, none selected topics from the pro forma charter list. After discussion with the groups, it was apparent that it was critically important that the PITs agree on a topic of study that was of great interest to the members. The pro-forma charters gave the PITs ideas for topics of study and an example of a reasonable scope of work, but did not provide a sufficiently good match with team member interests. The following

Table 3. PITs Activity During the Winter of 1998/9

Office	Topic	Results
Various District 6	Reviewed pilot implementation results for traffic control supervisor specification	Modifications to specification
Various District 6	Plan review process	Improved procedures for participating offices in cooperation with the Office of Design
Various District 6	Simplification of Guard Rail, Clearing and Grubbing, and Overhaul Bid Items	Recommendations accepted for Guard Rail and Clearing and Grubbing.
Council Bluffs Construction Residency	ACC Plan Review Checklist	Carried over to next season
Creston Construction Residency	PCC Plan Review Checklist	Carried over to next season
Red Oak Construction Residency	Grading Plan Review Checklist	Carried over to next season
District 3	Coordination of Materials Acceptance Audits between TC and Construction Residencies	Carried over to next season with pilot implementation during 1999 construction season.
Marshalltown Residency	Similar to NWITC	Internal review of own practices
District 2	Continuation of Field Fence Study	Revised Standard Plans
District 2, Offices of Design, and others	Development of Rebar Study	Developed a manual
Decorah Construction Residency	Standard Procedures for Collecting Field Information for Designers	Carried over to next season
District 5	Streamlining Field Reporting Process for Structural Concrete	Pilot test of new process, likely statewide implementation
Benchmark Steering Team	Field Tile Study	Best Practices Report

describes team formation, topic selection, and facilitation. This information is summarized in Table 3. For brevity, the descriptions of the study topics and the results are very limited.

District 6 has three residencies. Three teams were formed; however, each PIT had members from all three residencies. The PITs were formed through meetings and communications among the DCEs, the three RCEs and prospective team members with the assistance of Dr. Mark Federle. During team formation, prospective members placed a high priority on studying particular problems that were of interest to them. If they found enough other prospective members with similar preferences, they volunteered to join that team. Otherwise they chose to be assigned to other duties rather than participate on a team that was studying a different subject. Team members commented that they especially enjoyed the opportunity to work with their peers in a different residency. However, since the residencies were in close proximity, the negative aspects of winter travel were minimized. In each case, one team member served as the leader, and the teams completed their projects without outside facilitation.

One team reviewed pilot implementation results for the traffic control supervisor specification that was previously developed by a regional process improvement team. They recommended that the specification be modified to require daily documentation of traffic control setups and to require that the traffic control supervisor assume responsibility for flagger training. Another PIT developed recommendations to improve the plan review process. They suggested providing more copies of plans so that several people in the residency could review simultaneously and creating checklists to assist inexperienced reviewers. It was also recommended that designers be invited to pre-construction meetings and post construction reviews. The third team recommended ways to simplify three bid items. The Office of Contracts, which is a significant stakeholder for bid item changes, supported the recommendations for two out of the three bid items.

Three PITs also worked in the District 5; however, their process of formation and their motivation to volunteer was quite different. There are three residencies in this District and each has experienced considerable turnover due to recent retirements. More of the same is expected in the near future. Junior and senior employees alike are concerned about the need to transfer knowledge and experience before the retirements occur. During a meeting with the DCE, each RCE was assigned to develop a checklist for plan review on one of three topics: asphalt paving, concrete paving and grading. This decision was made without communicating with the PIT that recommended the development of plan review checklists. It was intended that the checklists would be developed as teams made up of senior people and junior people reviewed the plans together. The PIT team meeting would provide an opportunity to transfer experience and the checklist would preserve knowledge of the future. Volunteers came forth and the checklists were developed. As expected, the PIT meetings provided a forum for mentoring.

Although no outside facilitation was required, the first author discussed strategy and offered encouragement to one of the residencies during a three-hour meeting.

Three PITs also operated in northeast Iowa. One PIT completed the field fence study that started during the previous winter. Another regional team was started to investigate rebar placement issues. PIT members invited designers from the Office of Structures to join them. The team developed a reinforcing steel placement handbook that included a short narrative explaining why it is important to properly place reinforcing, several pictures giving example of proper placement and several checklists for use on various structural elements. The third PIT was based in the residency that formed the self-directed work group in the previous year. They developed standard procedures for collecting field information for design purposes (pre-letting information). It is expected that plan quality will improve if the format information input from the field is more standard.

The Southeast Iowa DCE sent a general request for volunteers form a PIT. There was considerable interest among volunteers in streamlining the field reporting process for structural concrete, so that topic was chosen for study. The first author facilitated the initial group meeting and assisted in writing a charter that described the proposed method of study. During later meetings an Iowa DOT staff facilitator assisted. The DCE served as the team leader. Using a method similar to that used by the Jefferson Residency, the PIT developed a new form that includes all the required information for a week. The form is faxed to the Office of Materials at the end of each week. The form was pilot tested the following summer and has been adopted for statewide use for the year 2000 construction season. Approximately six meetings of two to three hours each were required to complete the project.

The North West Iowa DCE noticed that there was considerable concern about how to coordinate job closeout material acceptance audits between the residencies and the District. There was considerable concern about possible overlapping activities. Residency-based PITs were not considered a viable option because the offices are smaller in this portion of the state. With smaller staffs there is less flexibility to accommodate process improvement activities. Therefore the PIT was launched with two members from each of the three residencies. The District auditing staff was also represented. The team was facilitated by trained facilitator from the Iowa DOT staff. At first, had several concerns regarding the exact topic of the study and the expectations for the final result. It also became apparent that some of the team members were assigned to PIT and did not volunteer. After these initial concerns were addressed, the PIT became quite effective. A flowchart was developed for the entire process; many of the original concerns were put aside when each work group developed a better understanding of what the other was doing. The PIT developed improved checklists and recommended procedures to track the acceptance status of materials during projects. Recommendations were made to streamline materials acceptance procedures. The Marshalltown Residency

conducted an internal review of their practices with regard to material autdits and exchanged exchanged information with the District 3 PIT.

The Steering Team also acted as PIT during the winter of 1998/9 and studied field tile issues. Field tile systems provide drainage on agricultural land and must be modified when highway construction takes place. The location and size of such systems is not known before exploratory work is conducted as part of a grading project. Then solutions must be devised quickly so the tile lines are cleared and construction can proceed. This PIT set policy for modifying tile systems and developed a narrative that answered frequently asked questions and gave examples of typical tile system modifications.

Not all residencies participated in the process improvement. One residency had an unusual amount of winter work. Another is located near the central office and has considerable opportunity to participate in process improvement through direct contact with central office personnel. Key people in the Jefferson residency were facing health issues and other members were looking for a change after concentrating their efforts on process improvement during the previous winter season. Therefore they did not form a PIT.

Table 4. Summary of PIT activities that were organized in the fall of 1999

Offices	Subject
District 5	Review of pipe culvert layout
District 3	Materials audit team (carryover from last season)
District 3	Guard Rail Review Team
District 6 (primarily Davenport Construction)	Electronic Documentation
Decorah Construction	Information Collection for Designs (carryover from last season)
District 2	Planned one other team, but topic has not been selected
District 4	Plan review checklists (carryover from last season)
Des Moines Construction	Barrier rail mix design (turbo team)
District 1	Inspection of items built for local systems

PIT Activity for the Winter of 1999/2000

There was less PIT activity during the winter of 1999/2000. There are several possible reasons. One is that the fall and winter season were mild and allowed construction to continue. Another is that several groups carried projects over from the previous year. Additionally, extensive effort was directed at having a winter workshop to share best practices and identify areas for improvement in the specifications and policies on ACC paving, patching and erosion control.

Lessons Learned and Conclusions

The Steering Team was gratified with the amount and quality of process improvement activity during the winter of 1998/9, especially compared to the previous winter when activity of less than expected. It appears that persistence, top leadership commitment, and examples of previous success paid off. Although only three residencies and one regional team were involved in process improvement in the winter of 1997/8, it was apparent during later discussion that many had given it serious thought. By the time they were ready to start during that winter, it was too late and construction projects for the next summer were starting. When the steering committee offered the opportunity again earlier in fall, with pro-forma charters, encouragement from the DCEs, and concrete examples of past successful projects, participation increased substantially. Although groups did not select topics from the list of pro-forma charters, these charters were effective in focusing discussion about the need to participate in process improvement and the types of topics that are appropriate for study by PITs.

A flexible approach regarding team formation, topic selection and facilitation is helpful. Some teams were formed with people from several residencies because team members wanted to work with people outside their office, while other teams formed within offices because it provided an opportunity for senior team members to mentor junior team members. Each work group has its own personality and since process improvement is a voluntary activity, team members must be allowed to optimize arrangements on a team by team basis. In some cases, supervisors selected topics and found volunteers who wanted to participate. In other cases, the team members chose a topic and persuaded their supervisor to lead the team. In still other cases, team members selected topics and executed the study without supervisor involvement. Some teams elected to continue their activities from one winter season to the next while other opted to take a year off.

The need for facilitation varied greatly. Some teams included facilitators at every meeting while others worked completely without facilitators. In most cases, the teams appreciated guidance on how to conduct the study and what to expect for an end result. Most of this information could be transmitted in one or to meetings at the beginning of the process improvement effort. In general, team members were anxious to start the investigation and had little interest in team building exercises.

Many team members have received training on working in teams as part of Iowa DOT's general training program.

Team members were motivated to volunteer because participating in a PIT allowed them to personally make a difference by improving their work, while interacting with their colleagues. To many, such an opportunity was better than more solitary activities such as closing out project, updating as-built drawings, reviewing new projects and setting up projects for the following year. However, there were always enough people who preferred not to work in PITs, so that these routine activities were not ignored. Also, participation in a PIT did not consume all of the members' time; therefore they were also able to assist with routine work. Since team members often volunteer in order to have a change of pace, after they have participated, they may choose not to volunteer, again, to have a change of pace.

Since team members want to make a difference, it is important to implement PIT recommendations. Implementation often requires supervisors to champion specification and policy changes. After the recommendations have been implemented, it is important to communicate with team members. Successful implementation should be highlighted to encourage prospective team members to volunteer.

FUTURE DIRECTIONS

Continuous improvement has matured in the past five years; it has evolved from energetic new initiative to an expected way to conduct business for many members of the Offices of Construction. Originally one or two statewide PITs were launched each winter. By contrast, during the winter of 1998/1999, fourteen PITs were launched, several at the residency and district levels. Originally the measurement system consisted of several opinion surveys. Some of these surveys have been repeated several times. Although the response has changed little from year to year, they have provided a good baseline for the performance of the Offices of Construction. While the original measurement system was effective for pointing out areas where improvement was needed, it is not sufficiently refined to measure the effect of individual improvement efforts. More interaction with the technical staff in the field is required to support the operation of PIT teams at the residency and district levels. The use of the surveys will be discontinued for at least three years to allow time for recommended changes to be implemented.

In order to address the current situation, the continuous improvement process must change. After discussion in recent Benchmark Steering Team Meetings, a new approach has been developed to identify areas for improvement and encourage participation in PITs using field visits during the construction season (see work plan below).

Work Plan

During the winter, the benchmark steering team will meet as a group to monitor PIT activities and to plan the future information gathering activities. From January through May 2001 Dr. Jahren will be unavailable to the Benchmark Steering Team due to international travel commitments for a Professional Development Assignment at Iowa State University. The Benchmark Steering Committee will use Dr. Jahren's absence as an opportunity to meet without an outside facilitator and assess its needs for facilitation. The scope of future contracts may be substantially altered as a result of that assessment.

The Offices of Construction Benchmark Steering Committee will continue to guide the continuous improvement process by

- identifying areas that require improvement,
- developing strategies for implementing improvement,
- implementing improvements, and
- developing methods of measuring that infer whether or not the improvements are having their desired effect.

The Benchmark Steering Committee will continue to be active as follows:

Field visits – Field visits will be conducted on a monthly basis during the construction season. In order to reduce travel requirements for the technical staff during the construction season, field visits will be conducted in various geographic locations and steering team members who are close to the location will attend. In some months, the Benchmark Steering Committee may split into two groups and make separate visits. During the field visits, the Benchmark Steering Team will collect information on problems that were identified during residency meetings, focus group meetings, and benchmark steering committee meetings during the previous winter. The information from the field visits will be used to develop strategies for improvement, including charters for future PITs. In addition, the Benchmark Steering Committee will endeavor to meet with past PIT members to discuss the operation of PITs and to identify future PIT members.

Coordination and Strategy Development – Conference calls will be used to coordinate field visits, to share information, and develop strategies to implement improvement.

Initiating Improvement Efforts – The Benchmark Steering Team will initiate improvement efforts by launching PITs or organizing conferences, workshop or focus groups.

Recommendations for Better Measuring Systems – Based on a literature review and discussions with other experts in continuous improvement, Dr. Jahren will

recommend methods to measure the effect of improvements after implementations to ensure that the improvements are having their desired effect.

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APPENDIX A
KEY FUNCTIONS AND MEASURES
OFFICES OF CONSTRUCTION IOWA DOT

The final list of key processes (underlined) and their corresponding performance measures (bulleted) follow:

Inspection of Work

- Offices of Construction employee evaluation
- Contractor evaluation
- Cost of inspection as a percentage of contract volume, statewide, on an annual basis (direct inspection costs, not including supervisory or overhead costs)

Resolution of Technical Issues (a technical issue is one, that at any level of inspection, must go to a higher level of inspection, e.g., interpretation of plans and specifications)

- Offices of Construction employee evaluation
- Contractor evaluation
- Number of litigation cases per year
- Litigation pay-out per year
- Number of claims per year (a claim is a formal complaint from the contractor that has not yet gone to court)
- Number of repeat problems with plans and specifications (to be developed as a measure in "Continuous Feedback for Improved Contract Documents in the future)

Documentation of Work Progress and Pay Quantities

- Offices of Construction employee evaluation
- Time from project acceptance to final payment (project close-out)

Provide Safe Traffic Control

- Offices of Construction employee evaluation
- Contractor evaluation

- External customer (national motor carriers and law enforcement officials) evaluation
- Number of accidents in interstate and highway construction zones

Employee Development and Training

- Offices of Construction employee evaluation
- Contractor evaluation

Continuous Feedback for Improved Contract Documents

- Cost over-runs as a percentage of total contract volume
- Offices of Construction employee evaluation of the number of repeat problems
- Contractor evaluation of the contract documents and the associated number of repeat problems

Providing Pre-Letting Information (survey information, patch estimates, clearing and grubbing estimates, etc.)

- Offices of Construction employee evaluation

External / Public Communication

- External customer evaluation

APPENDIX B
SUGGESTED CHARTERS FOR WINTER 1999/2000

The committee discussed methods to ensure that PITs will address high priority topics.

IM 204

John Adam will be leading an effort to revise IM 204. Residencies could contribute to the effort by developing a list of items where materials acceptance procedures could be improved. The committee listed some items that seem to be unnecessarily cumbersome. These items require samples:

- Warning tape
- Subdrain
- Emulsion (already certified, but sometimes it does not pass the test due to deterioration during storage.
- Conduit (both plastic or steel)
- Galvanized pipe

It might be desirable to raise the small quantity limit for full materials certification for ACC and PCC.

Members will circulate IM 204 in their residency for comments. They will also try to identify potential volunteers, who could meet Ames to assist with revising IM 204, in case the Office of Materials requests such assistance. John Smythe will check on possible participation for the Offices of Construction and will share the charter that was developed on this subject in August 1998.

Erosion Control

Measuring for payment on erosion control seems to be unnecessarily time consuming, especially considering that the item usually has low unit prices. The committee suggested requiring contractors to make the measurement while Iowa DOT checks them. It was noted that we should not expect the contractors to make the measurements in the same way that the Iowa DOT has in the past. It will be necessary to give some guidance about how the measurements are to be made. Possibly a form could be developed to encourage uniformity and provide an audit trail. The team members might include the following:

2-3 Contractors
3-4 Inspectors
1-2 Auditors

FHWA Rep.

It could be set up as a *turbo team.* This means that the team would meet only once to make recommendations for a pilot implementation for one construction season, then meet again in the following winter to recommend additional refinements.

Checking Scales

After examining the charter for reviewing the scale checking procedure, the committee recommended that activity be limited to changing the Construction Manual so it accurately describes current practices. The Office of Construction will execute this task.

Inspecting items that will maintained by local jurisdictions.

The committee discussed a method for launching a process improvement team that will address the difficulties that the Offices of Construction have experienced when they have inspected items that will be maintained by local jurisdictions. Examples are traffic signals, storm sewers and water mains. One approach would be to make arrangements for the local jurisdiction to inspect such items with their own forces or a consultant of their choosing. The appropriate Transportation Center Project Development Engineer (PDE) should negotiate such an arrangement when the project is first contemplated. The following entities are stakeholders in such negotiations, and should therefore be included in a process improvement team.

- PDEs
- Consultants
- Iowa Public Works Association
- Inspectors

The process improvement team would develop a checklist that would remind negotiators to consider many different alternatives for executing inspections of locally maintained items. The study could commence with inspectors and PDEs working as a Turbo Team to define the problem from the Offices of Construction point of view and to suggest some alternative solutions. This could be a winter activity. Next a group that includes all stakeholders could work to develop the checklist during two to three meetings. The checklist could be pilot tested and then refined.

APPENDIX C
SUGGESTED CHARTERS
WINTER 1998-1999

Work Unit Teams

A discussion was held to define charters for work unit quality improvement teams. These charters were developed from a list of topics created during the June meeting.

IM's

The MQRG group from the Office of Materials is reviewing the IMs, especially IM 204 and IM 204 Supplement (they specify materials acceptance procedures). Two or more residencies could serve as a focus group to provide input on how inspectors use the IMs and how they could be improved. MQRG could consider this input as they propose changes to the IMs and material acceptance procedures. It might be possible to change the order or concentrate the IMs that the inspectors use in one volume. Probably materials acceptance methods are of more concern to inspectors than the actual test methods. Some of the difficulties in determining the correct acceptance procedure might be addressed by SiteManager. However, before the system is automated by SiteManager, it would be preferable to review it, so we don't automate the difficulties. The proposed tasks are as follows:

1. Meet as a residency team. Develop a list of things that you like about the IMs and things that could be improved. When developing the list, have team members recall specific instances from last construction season where the IMs helpful or a hindrance. It is important to give examples of good IMs so that the developers can make more like them.
2. Also while meeting as a residency team, describe how inspectors and other residency personnel use the IMs. Which IMs are used the most? How do you organize and update the IMs? Which IM's are taken out into the field? How do you organize them in a pick up truck or job trailer?
3. Send items 1 and 2 to MQRG for review. After MQRG completes the review, meet with them to discuss possible improvements in the IMs
4. MQRG will develop an action plan based on input from several sources (many of which will be outside of the office of construction). The plan will be distributed to the quality improvement teams.
5. Review the action plan and meet with MQRG to provide feed back.

Erosion Control

Can we get the same end result more efficiently? Current procedures require considerable inspection time. A work unit team should answer these questions. One possibility would be to

consider using planned quantity more often to reduce need for measuring areas for low value items.

1. Develop flowcharts, outlines and narratives that describe the current process for erosion control inspection.
2. Analyze the current process and highlight areas of inefficiency.
3. Investigate current practices for erosion control in neighboring states and other public agencies, such as the Corps of Engineers.
4. Using brainstorming techniques, develop a list of alternative processes that could be used in inefficient areas.
5. Vote to narrow the number of alternatives to three for each inefficient area.
6. Review alternatives with stakeholders, including the Office of Materials, the Office of Contracts, Office of Design, Office if Specifications, grading contractors and erosion control contractors.
7. Recommend changes.

Checking Scales

It is not clear that Iowa DOT follows its own rules on this. If the rules are not being followed and it is not a problem, probably the rules should be changed. A work unit team could investigate this and recommend changes. The team could also answer the following questions:

- When should a scale be checked?
- When should a scale sensitivity check be performed at a plant?
- When should trucks be tared?
- Are procedures being followed correctly?
- Should our procedures be changed?

The tasks are as follows:

1. Review and summarize current rules regarding scales.
2. Investigate current practice and see if it matches with the current rules.
3. List differences between current practices and rules.
4. Where differences are found, consider changing the rules to meet with current practice. Provide justification for adopting current practice.
5. Analyze current rules and identify changes that would increase efficiency without compromising quality.
6. Provide a list of recommendations.
7. Quantity the risks involved in cutting back on scale checks?
8. Are the costs of the checks greater than the costs of the risks?

Activities performed for other jurisdictions.

This refers to traffic signals, luminaires, storm sewer intakes and other items that are constructed under Iowa DOT inspection and then turned over to municipalities for operation and maintenance. Storm sewers, sanitary sewers, and water lines that are relocated as part of a project are other examples of such items. Inspection is sometimes awkward time-consuming because Iowa DOT personnel have little expertise on some of the items (traffic signals, for example). Also, since each municipality customizes them to some extent, it is difficult to make sure they are being constructed according to the exact needs of the municipality. How should DOT and local jurisdiction personnel interact to obtain good quality construction efficiently? Possibly more coordination is required during the design phase. If this is true, the Office of Design is a stakeholder in the process and should be included in the discussions. Under what circumstances should inspection be conducted by local jurisdiction personnel? A residency team could partner with a municipality to answer these questions. In the process, the group can develop a list of priorities for this kind of inspection.

1. Recalling specific situations from actual construction projects, develop a list of activities that have been problematic for inspection. In each case, be specific as possible about what caused the problem.
2. Review the list to identify categories of problems.
3. Pick the three categories that seem to be the most problematic. Concentrate future efforts on these.
4. Meet with representatives from a partner municipality. Brainstorm and list alternative solutions for the three most problematic categories.
5. Review the alternative solutions and select the best ones. Some possible solutions might include:
   - Contracting inspection out to local jurisdiction or consultant
   - Warrantees
   - End result inspection (turn it on; if it works, it must be OK)
   - Develop others on your own

   Provide justification for the selections.
6. Recommend the best alternative solutions.

Lighting Standards

A group is working to review and improve lighting standards for the Iowa DOT. A residency process improvement team could give construction input for this activity. Residency personnel would join the existing group and perform tasks assigned to them.

Chain Link Fence

A residency process improvement team could review contract documents for chain link fences and recommend revisions that would match current practices and commercially available products. Tasks for this project would be similar to the ones used by the NEITC for its field fence quality improvement team.

Stockpiles

Contractors are paid for items in stockpiles, before they are installed in the project provided that certain conditions are met. First, the item must be specifically manufactured for the project. It cannot be something that is commonly held in inventory. Therefore, structural steel that is fabricated for a bridge is often stockpiled. In addition, the items must meet quality standard and must be properly stored in a separate area that is designated for the job. When the item is removed from the stockpile and incorporated into the work, accounting must be performed to remove it from the stockpile account and charge it to the proper bid item. The FieldBook program is set up to perform stockpile accounting. Although the field book procedure is awkward, it does work if instructions are followed carefully. Since the FieldBook will be phased out soon, FieldBook procedures should not be reviewed. A work unit team should review procedures and recommend changes that will increase efficiency. Also, it would be desirable to develop a list of items that can be stockpiled. This is because there are some disputes with contractors about what can be stockpiled and what cannot (this item might be A regional team or a separate residency team.

1. Develop flowcharts, outlines and narratives that describe the current process for stockpile account.
2. Develop a list of items that are currently considered for stockpiling.
3. Analyze the current process and highlight areas of inefficiency.
4. Investigate current practices for stockpile accounting in neighboring states and other public agencies, such as the Corps of Engineers. Find out which items can be stockpiled.
5. Using brainstorming techniques, develop a list of alternative processes that could be used in inefficient areas.
6. Vote to narrow the number of alternatives to three for each inefficient area.
7. Refine the alternatives to ensure they do not result in an overly complicated system.
8. Develop a list of items that should be considered for stockpile accounting.
9. Review the alternatives and list of items that could be stockpiled with stakeholders, including the Office of Materials, the Office of Contracts, and contractors.
10. Recommend changes.

Topics for Regional Teams

Topics for regional teams were also developed in June. It seems reasonable that three such teams could be launched next winter. The benchmark steering team discussed each topic and then voted to set priorities. The highest priority item received one vote from each participant and the lowest priority received six votes. Therefore the item with the fewest votes had the highest priority.

Materials Acceptance Procedure (10 votes)

Every region has it own requirements for the materials audit. Material acceptance requirements (IM 204 and IM 204 supplement) are confusing. It seems that there is overkill on certain materials and underkill on others. Suppliers do not send certifications to the proper place. Instructions on where to send them change with each item. A method is needed to assure that enough material has been certified to cover the job (the item may have been previously certified and transferred from a different job). Longitudinal drain and paint beads are especially difficult in this regard. If the certified quantity is insufficient, the inspector brings it up to the contractor and the supplier sends another certification. There is no way to match that this certification is related to the material used on the job. It is hard for inspectors to remain motivated when they see this happen. Two other problems to consider are as follows:

- Documentation requirements are not uniform among regions.
- When an item is accepted as an approved brand, sampling is still required in some cases. Although there are reasons for doing this, it is difficult for the field staff to understand them.

Procedure: Working with MQRG, this group could review Section III of the report for HR 377 – Field Data Collection and Reporting procedures and consider the recommendations. One possible solution might be to consider the use of approved brand as an acceptance method for more materials.

Erosion Control Schedules (12 votes)

Stabilizing crop seeding has a lower priority than permanent seeding for erosion control contractors for several reasons: They have prime contracts for permanent erosion control and subcontracts for stabilizing crop (contractors tend to work on their prime contracts first). In many cases there are incentives for the permanent erosion control and none for the stabilizing crop. There is also a narrower weather window for permanent seeding. During the weather window, most contractors work on permanent seeding and it is hard to get someone in to do the temporary work. Further problems are encountered at the end of the grading season when all the grading contractors request stabilizing crop to be seeded at the same time. It would be desirable to review these scheduling and priority problems and have a bigger weather window for the permanent seed.

Procedure:

1. Review specifications and construction manual and recall member experiences on jobs to determine current practice.
2. Interview erosion control and grading contractors to obtain their perspective on the problem
3. Develop a list of problems to be addressed and their causes.
4. Brainstorm a list of possible solutions.
5. Narrow the list by voting.
6. Discuss solutions on the shortlist with stakeholders (designers, contractors and others).
7. Recommend the team's preferred solutions.

Inspection Priorities (16 votes)

This topic involves reviewing the inspection priority list that was previously developed during a winter meeting. We have had two seasons of experience with this list, and it probably could be improved with the benefit of this experience. Items that were given low priority are now sometimes problematic. Is the priority too low? In the past, when inspectors were always around, contractors relied on inspectors to help them build according to plan. Now inspectors may be busy elsewhere, so the contractor may have to start without help and present a finished product to the inspector for final inspection. Is this the right way to do things? Or should more effort be directed toward helping the contractor get a good start in hopes that more things will be built correctly when that is practiced? The Benchmark Steering Team believes that a good priority list will be a helpful training aid by making priorities more apparent to new people.

Procedure:

1. Review the current list of priorities and look for conflicts.
2. Solicit input from colleagues about when the list worked and when it did not.
3. Enumerate all examples of when the list worked and when it did not.
4. Analyze the list to identify patterns.
5. Recommend improvements based on the analysis.
6. Recommend changes to the contract documents that would improve overall inspection efficiency

This could be done by having workshops at the TC level attended by representative from each residency. Then another statewide workshop could be held with representative from the TCs.

Stockpiling (22 votes)

Cut, part of previouly-described work unit charter.

Mix Design Problems (32 votes)

The Benchmark Steering Team believes that most of the problems reported were job specific on ACC projects. Currently this item has a low priority for statewide action.

Have Office of Materials do Materials Approval (32 votes)

This item is currently being addressed by having the Office of Materials inspect the plants. Glen Miller's report above addresses some of the problems that go with the change.

APPENDIX D
OFFICES OF CONSTRUCTION EMPLOYEE SURVEY 1999

Your Position (Check all that apply):			EA- 1	EA- 2	CT- 1	CT- 2	CT- 3
Secretary	Inspector	TEA	Engineer	Surveyor	Other		

Transportation Center (Optional):_____Years with the Iowa DOT: _____

Please evaluate the Iowa DOT Offices of Construction in the following areas:

NOTE: This survey has been designed for all construction office employees. If a particular question does not apply to you, please circle NA.

INSPECTION OF WORK

	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) the clarity of your duties	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(2) your understanding of the priority of your duties	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(3) the ability of the inspection process to influence the final quality of Iowa DOT construction projects	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(4) the amount of duplication of effort in the paperwork you complete (5 = Small amount, 1 = Large amount)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(5) the amount of nonproductive activity that occurs during the inspection process (5 = small amount of nonproductive activity, 1 = a lot of nonproductive activity)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(6) the overall quality of the inspection process as it is now	**5**	**4**	**3**	**2**	**1**	**NA**	**U**

Comments:

RESOLUTION OF TECHNICAL ISSUES

	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) your confidence that your supervisors will support your decisions	5	4	3	2	1	NA	U
(2) communications within the Iowa DOT construction offices during the resolution of technical issues	5	4	3	2	1	NA	U
(3) communications with contractors during the resolution of technical issues	5	4	3	2	1	NA	U
(4) the timeliness of resolution of technical issues	5	4	3	2	1	NA	U
(5) the amount of nonproductive activity that occurs during the resolution of technical issues (5 = small amount of nonproductive activity, 1 = large amount of nonproductive activity)	5	4	3	2	1	NA	U
(6) the current overall quality of the process of resolving technical issues.	5	4	3	2	1	NA	U

Comments:

PROVIDE SAFE TRAFFIC CONTROL

	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) contractors' knowledge of traffic control regulations and specifications	5	4	3	2	1	NA	U
(2) contractors' concern for traffic control	5	4	3	2	1	NA	U
(3) the quality of plans and specifications provided by the Iowa DOT for traffic control	5	4	3	2	1	NA	U
(4) the current overall quality of the process for providing safe traffic control	5	4	3	2	1	NA	U

Comments:

DOCUMENTATION OF WORK PROGRESS AND PAY QUANTITIES

	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) the amount of time you spend documenting work progress and pay quantities (5 = a reasonable amount, 1 = too much)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(1A) For the average week last construction season, estimate the percentage of your time that was spent on documentation of work progress and pay quantities		_____%					
(2) the amount of duplication of effort in the paperwork you complete (5 = a small amount, 1 = a large amount)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(3) the amount of nonproductive activity that occurs during the process of documenting work progress and pay quantities (5 = a small amount, 1 = a large amount)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(4) the overall quality of the process of documenting work progress and pay quantities as it is now	**5**	**4**	**3**	**2**	**1**	**NA**	**U**

Please list areas that would benefit from automation, that are not currently automated:

Other Comments:

EMPLOYEE TRAINING & DEVELOPMENT

	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) my ability to do my job with the training I have	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(2) the extent to which structured classroom training and development sessions have been beneficial	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(3) the extent to which on-the-job training (from supervisor or co-workers) has been beneficial	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(4) the extent to which the training you receive is applicable to your job	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(5) your ability to request a specific training session	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(6) your ability to obtain a specific training session	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(7) the scheduling of training sessions	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(8) the current overall quality of training	**5**	**4**	**3**	**2**	**1**	**NA**	**U**

Please list areas where additional training is needed:

Please list areas where less training is needed:

Other comments:

CONTINUOUS FEEDBACK FOR IMPROVED CONTRACT DOCUMENTS	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) the *clarity of instruction* you receive before reviewing plans (what to review and how to review it)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(2) my level of satisfaction with the amount of *time allotted* to review the plans	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(3) the responsiveness of the Iowa DOT to your plan review suggestions	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(4) your opportunity to make suggestions for improved specifications	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(5) the responsiveness to your suggestions for improved specifications	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(6) The number of repeat problems that occur during construction (repeat problems are those that have occurred in previous construction projects and still occur in subsequent projects)	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(7) the overall quality of the process of providing feedback for the continuous improvement of contract documents	**5**	**4**	**3**	**2**	**1**	**NA**	**U**

Comments:

PROVIDING PRE-LETTING INFORMATION (obtaining and furnishing data for plan development: surveying, patch estimates, clear & grub estimates, etc.)	Excellent	Good	Satisfactory	Marginal	Poor	Not Applicable	Unknown
(1) my level of satisfaction with explanations regarding *why* information is needed	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(2) the *clarity of instruction* I receive on what information is needed and how to obtain it	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(3) my level of satisfaction with the amount of *time allotted* to gather the information	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(4) my level of satisfaction with the amount of *feedback I receive* regarding my performance	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(5) my level of satisfaction with the *defined procedures* for handling requests for pre-letting information	**5**	**4**	**3**	**2**	**1**	**NA**	**U**
(6) the overall quality of the process of providing pre-letting information	**5**	**4**	**3**	**2**	**1**	**NA**	**U**

Comments:

SUMMARY

Please list areas where you have noted improvements in the last three to five years:

Please list areas where you have noted increased difficulty in the last three to five years:

Please list concerns that have not been addressed in the survey and comment on them:

APPENDIX E
WRITTEN COMMENTS
OFFICES OF CONSTRUCTION
EMPLOYEE SURVEY
1999

INSPECTION OF WORK

- No breaks over this winter season.
- Because of the reduction of staff and budget, inspectors cannot inspect as much as they used to in the past. There should be closer attention to details such as traffic control and erosion control. Efforts need to continue to make project item documentation less time consuming and allow inspectors enough time for their inspection duties.
- Continually trying to do more with less.
- Inspection Priorities – Inspectors need more guidelines on setting priorities of their time on the project.
- Still some duplication of work but has improved the last 2 – 3 years. Priority of duties depends on what king of project you are on.
- Need more on line inspection forces to accomplish our mission (Do not mean summer help or maintenance people.)
- Not enough inspection staff for most paving projects.
- Continue to make studies in improving the inspection process.
- "Too much inspection being done from behind the windshield, for as many hours as he/she wants".
- Workload is larger than the manpower there is available to do the inspection.
- The ability of inspection process depends on contractor.
- Pit teams and the construction field procedure teams have helped some duplication of paperwork.
- Need to help people understand where specifications can be flexible.
- Double work.
- Inspection process is low. Low money and few inspectors.
- The inspectors need to be able to make decisions and backed by supervisors. Lack of communication from supervisors down.
- Not enough inspectors. "Management could save their tan money by letting fewer contractors so supervisors could monitor construction being done.
- Too much time spent on the new computer system making inspection poor.
- Contractors care more about getting it done than quality.
- "The problem I see is cutting hours. We are not going to get quality products the tax payers deserve".
- The workload keeps increasing. No quality acquired.
- Inspection process cannot be performed well because of contractors' influence.
- Quality of work/inspection process drops due to contractors being able to call either RCE office or Central construction to overrule the site inspector. Duplication still exists.

RESOLUTION OF TECHNICAL ISSUES

- Too much help is provided at times.
- Very good this year.
- Good response from soils people (Design).
- Improved response from Ames. Improved the time frame for resolution on technical issues in the last 4-5 years.
- "Our office works well to keep the contractor informed, but if resolution has to come from higher up," things seem to slow down.
- Lack of communication with the contractor, especially when a change order has been written.
- We sometimes get bogged down in paper work when consultants are involved in technical issues."
- The contractors' response is often a delay in resolutions.
- The need for feedback during the resolution process needs to be stressed.
- Problems need to be addressed not at the last minute.
- Poor design of projects.
- A lot of times critical time is lost due to someone not making a decision.
- "When there is a conflict between contractor and inspector, the contractor goes straight to district (if not Ames) to get around doing work as specified."
- The transportation center in Ames takes a long time to answer technical issues.
- Most technical issues are resolved in a professional manner.
- Supervisors tend to manipulate the proposed solution. Supervisors solve problems with contractor without consulting the inspector.
- Excellent most of the time.
- (Question 2,3,4,and 5) depend on the contract.
- Office requires a lot of red tape and processing extra work orders.
- Ames needs to support field decisions.
- Better communication of ideas. Technical issues are being handled more efficiently.

PROVIDE SAFE TRAFFIC CONTROL

- Sometimes the contractor gets too busy to notice signs down, etc.
- More emphasis has been put on traffic control. Today the majority of contractors do a much better job in placing and maintaining traffic control.
- Contractors have no incentive to set up or maintain.
- Contractors need to be more responsible regarding traffic control.
- Contractors are always reminded from the DOT inspectors about traffic control.
- Getting contractors to do their job in traffic control is not easy.
- It varies from contractor to contractor.
- Main contractors are all aware of the importance of traffic control, but minority subcontractors are still very lax.

- "Placing responsibility for daily sign surveillance on the contractor, would help both, the contractor's concern and inspection productivity."
- Contractors do not care much about traffic control.
- Traffic control training is available for the contractor and DOT.
- Traffic control should be stressed for intermediate stages of construction.
- Traffic control varies from contractor to contractor.
- Fog is not an area very well covered in traffic control.
- Traffic control with contractors is a problem.
- The quality and knowledge of traffic control by contractors have improved.
- Contractors do not follow specification changes well. Most contractor representatives are not very concerned. "The DOT becomes too much of a babysitter and too much time is spent on traffic control." There should be higher penalties for violations.
- Traffic control not taken seriously by the contractors. Trained permanent employees should be designated to traffic control.
- The contractor needs one person as a traffic coordinator.
- If contractor does not comply with specs, there should be a large penalty.
- Traffic control is not in high priority with most of he contractors.
- "At times the contractors act like they do not have the standards and have not clue about what the traffic control should be."
- Most contractors are excellent about traffic control.
- Not every traffic control layout is covered in the standards; some need to be designed to meet the situation.
- Contractors are either very good or very poor about traffic control.
- For liability purposed need to be more specific.
- Traffic control regulations are not being followed.

DOCUMENTATION OF WORK PROGRESS AND PAY QUANTITIES

List areas that would benefit from automation, that are not currently automated:

- Materials certifications. Inspectors spend too much time with material reports. Inspectors' time could be spent more wisely.
- Backup documentation.
- Audit process is a problem leading to documentation backup.
- Material certifications.
- Material certifications.
- Prints of plans at the RCE (1/2 size, full size and scrolls). Specs book.
- Material certification would help a lot.
- Drawings.
- Put the form 170 EEO Report and Interview an the computer also. Put also the storm water checks weekly on the computer.
- The quality of the documenting works process and pay quantities is low due to technology.
- PC plots.

- In the field books there is no adequate place for measurement sketches. Have to go to Lotus, Excel, or hand copies. Is Excel going to be available in the new computers?
- Support documents for fieldbook such as: Seeding areas (Drawings), piling reports, etc.
- Spec book linked to item code of electronic field book.
- Final audit items such as: 435,436, contractor evaluation, and proposal.
- "Handheld computers for all field staff."
- "Contractor to state back to contractor relations, (site manager)."
- "As an RCE I do not document daily work progress and pay quantities."
- Electronic field book has reduced the voucher paperwork, but has added some computer time for secretaries.
- "No working day is charged on Saturdays. Overtime is being held down, so working day should be charged for Saturday."
- If the field book and automation are being used, why are drawings needed to back every thing up?
- Support documentation. On-line update specifications and road standards.
- Audit.
- Documentation of work progress and pay quantities were productive activities.
- Less automation. There is not enough time observing the contractors progress.
- Small hand held computers for the field that can transfer data to big computers at the office.
- Not convinced that the computer has benefited the paper work issue at all. Many inspectors keep a dual set of books for documentation purposes. This has proven to be beneficial when there has been computer problems.
- The central office is the only one benefited from automation. It has created more work for the field offices. Work orders, stock pile material and daily diaries should be documented by the inspector not the office personnel.
- Being able to document right away in the computer.
- All forms used for projects should be made available in computer format.
- Getting better quality and reducing duplication of paperwork.
- Field book 2 is a step backwards.
- Supervisor to process pay quantities and change orders.

Comments:

- The electronic field book is a good tool.
- More training on different computer programs is needed. Several employees are not into computer use.
- Too much time spent on documentation rather than making sure that there is a quality product.
- Hurting the overtime budget.

EMPLOYEE TRAINING AND DEVELOPMENT

List areas where additional training is needed:

- Project duties, Inspector/Contractor relationships. Technical – structures, grading and paving. Erosion control.
- Survey.
- Issues related to Row. Basic math and geometry.
- Additional safety training.
- Traffic control during construction on high-volume roadways.
- Microsoft Excel.
- Computer training.
- Computer
- "Field Book and Field Manager."
- "Computer training: Excel."
- Traffic control.
- More "hands-on" computer practice.
- Computer software. Training in Excel and Word.
- Typing course would be beneficial considering all the computer work involved.
- Survey school for employees that have not yet attended one.
- Basic and advanced survey. New equipment should be used for the advanced survey. Public relations training.
- Newer employees need more skills.
- Geometer training for newer employees and survey school should be mandatory.
- New employees should have to work a minimum of 2 years on survey before they are allowed to go out on inspection.
- More local training for computer and other DOP classes.
- Computer.
- Reading plans and grading.
- Survey and how to run tests on soils.
- People need more time to read specs.
- More computer training.
- Dirt work and paving inspections.
- In-house training on computers rather than field books.
- Inspector-based basic survey training.
- More discrimination classes.
- Faster training for new employees. Better cross-training for new employees.
- HP 48 GX graphic calculator.
- Project auditing for office technicians and assistants.
- In areas that provide understanding of other people's roles responsibilities and expectations.
- Basic survey.
- Surveying, field book usage, and Microsoft Office.
- Computer (more general things).
- Computer training.
- Additional training (computers).
- Computers.
- Surveying.
- More intense training in inspection procedures (new inexperienced personnel).
- Time management and personnel development.

- Class on windows 98.
- Computer software.
- Good understanding of survey principles related to grading structures and paving. Difficult to get time off work.

List areas where less training is needed:

- Management Theory.
- Leadership training for managers and supervisors should be reduced in time.
- In house inspection training.
- "Work place diversity."
- Leadership course is too long.
- District construction meetings are not beneficial.
- Survey.
- Extend the time between material's certifications.
- Teams.
- EEO/AA
- PDS's.
- Leadership training.
- Leadership and managerial training.
- Employees are offered more training then needed.
- Continual re-certification .

Comments:

- "On-the-job training during my first year has been excellent. The Engineer and staff have been very helpful in the training process."
- "Project development does a good job training employees."
- Field personnel could have CAD training.
- Each employee should at least get update training for the type of work they will perform that construction season."
- "Sometimes no matter what we do, we can find no time to schedule training classes."
- "The DOT has the best training system I have ever seen."
- Every one should be allowed to get DOT training even if it is not job related. This results in better-educated employees.
- "For a few years we could take training we needed with no hassle, this past winter our training officer wanted to dictate what he feels you need."
- Training sessions for construction personnel should be scheduled for January, February, and early March. Any other time has conflict with field inspection.
- Many hours have been spent on training in the last year.
- Hard to retain information that you learn in computer classes because is taught too much time in advance.
- Classes fill up too fast.
- Windows 98 before field book training would be helpful.

CONTINOUS FEEDBACK FOR IMPROVED CONTRACT DOCUMENTS

- Watched closer this year than in previous years.
- It would be beneficial if there were a few more days allowed to review plans.
- Not enough time for plan review. Suggested plan corrections are not being implemented.
- Need more feedback between Design and RCE.
- The PIT or Work Team Improvement Program has permitted employees to suggest improvements in the plans and specs. However suggestions are not necessarily implemented.
- Repeat problems with subdrain tab (lengths, side).
- "Again this process has taken a step backward since consultants are doing some 3R plans. Consultants need to be provided better direction."
- "Missing traffic control and standard road plans."
- Review consulted plans for errors.
- "Fly ash should not be used in handwork areas after Sept. 15."
- Plan review time is very limited.
- Not enough time to go over plans. Some times projects are on computer, but the computer information for the project has not been installed on your laptop.
- The last 3 years there has not been much information coming out of the field.
- Suggestions and comments are not being heard. Few suggestions are ever incorporated into the plans or design, therefore the problems keep reoccurring. Not enough time to review plans.
- Not enough time to review plans. No one pays attention to suggestions made.
- Problems with consultant plans. Not enough time to review plans.
- Not enough time to review plans.
- Clarity of instructions gives RCE the chance to convey their ideas to employees.

PROVIDING PRE-LETTING INFORMATION

- Often lead time to gather information is very short.
- "What a change" (Good).
- Ames offers satisfactory information on demo projects.
- Use more efficiently the time allowed to collect information rather than having the requests setting on someone's desk for weeks. This resulting in only a few days for actual data collection.
- Annual projects such patching on the same route is very difficult to estimate. Can anything be done?
- "SEITC keeps track pre-letting information."
- "Design engineers should set up a meeting with the RCE office staff when the design is _ completed to provide more time for input."
- On stage projects changes are not getting on the plans.
- Request for information come at the last minute and need to be done immediately despite whatever you are already doing.

- Consultants designing plans seems to be a problem. Mistakes on quantities can be costly. Consultants are not responsible for their own mistakes.
- Material is not available until it is needed in central.
- Employees make good suggestions, but little follow up is being done on ideas.
- Little guidance on patching tabs.
- No defined procedures for providing this information besides the standard patch tabs.
- Time allotted has been very limited.

SUMMARY

List areas where you have noticed improvements in the last three to five years.

- Field book on lap top computer.
- Increased responsibility and authority at lower levels. This seems to have reversed over the winter.
- Feedback form direct supervisors has improved.
- Better equipment.
- Ability to send more than one employee to seminars and conferences.
- Training automation.
- Emphasis in field resolution of technical issues.
- Automation.
- Resolution of technical issues.
- Resolution of problems within DOT structure.
- Overall training has improved.
- RCE Offices getting more involved. However improvement is still needed.
- Work unit teams. However more involvement is needed.
- Communications between inspectors, RCE officers, TC officers and Central Const. A lot of training for inspectors and surveyors. The overall attitude of the field people has improved.
- The AA/EEO policy reviews seem to be getting easier to complete. However, omitting these reviews would be great.
- The use of field book 2.
- Automated record keeping.
- Good managers' feedback.
- Traffic control, but still needs work.
- Computerized contracts pay items.
- Communications from the field to Ames.
- Communications.
- Due to computers, the amount of paperwork is starting to decline.
- Clarity of specifications, instructional memorandums, and road design standards.
- Use of laptop computers to document works progress and do periodic reports.
- Reduce paperwork.
- Paperwork for project finals has decreased. However there are still too many documents.

- Getting some engineers who use the common sense approach to solve construction problems. The newer ones are better trained.
- "It seems that every one is more willing to share information."
- Being able to use computers or field entries.
- Communications between RCE and central complex has improved, but there is still a big problem with communications with RCE, TC and materials.
- "Just recently we were allowed to get premixed urban seed. This should also apply to stabilized crop seed. This helps our inspection productivity."
- Electronics have improved.
- Field book and record keeping.
- Communications.
- "Added trust from office."
- The number of final forms and documents has been reduced
- Willingness of design squad to work with field staff if the proper match up of designer and RCE staff can be initiated and encouraged.
- Electronic book keeping in the field will eventually be a big boost in field productivity.
- Monitor/plant inspection field training.
- Communications process from engineer down to CT-1 and EA-2 are very poor.
- Training, communication, availability.
- There is more open communication.
- Computers. Some less paperwork and duplication.
- Communication in all departments.
- Plans.
- Clarity of plans has improved.
- Less duplication in record keeping. ISS trainers do a good job with computer training.
- Computers.
- Communication with supervisors.
- Better reports.
- Open minded on discussion from the central construction office.
- Use of laptops.
- Automation.
- Resolution of technical issues. Employee training.
- More quantities lump sum. "Quantities that have changed to plan quantities."
- Electronic field book.
- Use of computers and project documentation.
- People's ideas are not being taken seriously, so now no suggestions are made.
- Better equipment is available.
- Less paperwork and repetition.
- Technology.
- Timely communication.
- Reduction in paperwork due to the elimination of dual reporting.
- Availability of schedule training in local areas.
- Improve communication in the work place.
- Removal of contract administration.
- Reduced duplication of paperwork. More common sense in resolving issues.

- Equipment.
- Documentation work.
- Automation with computers and less paperwork.
- RCE has relaxed control on day to day activities.
- Traffic control.
- Not hiring any summer help.
- Better communication with designing contract departments.
- Computer technology. Making contractors more responsible for adequate work.
- Field book and new forms.

- **List areas where you have noticed increase difficulty in the last three to five years.**

- Lack of field technicians. Supervisors should get more involved in their projects.
- The influence of E.I.T.s acting as managers and supervisors with little or no experience.
- "Plan design is much worse than it has been at any other time."
- Not enough help.
- Loss of experienced inspectors. Failure to replace them. Budgets do not match inspection needs.
- Dealing with maintenance AMM's. They make management decisions without reviewing future plans for roadway systems.
- Traffic control notes and staging.
- Project plan content.
- Too much time spent in computers.
- More incomplete plans and contract documents. More work – less time available.
- Having time to do all the work with the cutback of people and the increased workload.
- Automated field book 1 has a lot of problems updating working days and transferring information to Ames.
- Keeping up with changes in technology.
- Plans. A lot of inconsistency between designs.
- Project plans.
- The paperwork is still staggering.
- Plans.
- Converting over to computer record keeping.
- Time to adequately handle all parts of job description.
- "Contractors getting their way with no compliance."
- Lack of communications. Tech IIs think that they are far superior and act like it.
- Still duplicating work before entering it in the computers.
- Problems with DBE contracts and the state's inability to deal with the incompetent ones.
- Maintaining interest while working on surveys. Supervisors do not allow more than a one-man survey crew.
- Surveying. New employees lack survey fundamentals.
- Time allotted for inspection is being cut too short because of the budget and not enough people to cover the work.

- Duplication of paperwork to report structural concrete. New form 044 for structures weekly grade report.
- Development of survey crew operations and basic understanding of basic operations.
- Problems with plans are difficult to solve. Sometimes contractors wait for weeks for changes in plans.
- Consultant plans with poor RCB's "elers."
- Communications (contractor and Dist. Matl's)
- Plans and design.
- Traffic control and patching when dealing with subcontractors. Concrete reports and lots of duplication.
- Laptop computer coupled with programming."
- Non-valued documentation. No emphasis on EEO/AA, safety inspections, and interviews.
- More mistakes on plans.
- "Computer when some people do not care to learn."
- More work fewer people.
- Spec changes.
- More information in soil classification.
- No leadership (lower levels).
- Not enough time to look at plans.
- Overtime budgeting.
- Plan errors.
- Certified plan inspection.
- Use of laptops, new field book. Quantity of training inadequate.
- Automation training.
- No one takes time to listen to other ideas.
- Not enough time for supervising work.
- Traffic control.
- Documentation is very time-consuming and too complicated.
- The way plans come out.
- Not enough inspectors in the field.
- Less inspection forces. Less time spent on inspections and more time spent on documentation.
- A lot of paper work, even with electronic book keeping.
- Increase problems with consultant designed plans.
- Information coming into the office is never getting used. No office partnering or office meetings on any projects.
- Employees need to know what projects are going to be inspected ahead of time not the day the day the contract starts. More time to review plans and get ready in order to be ahead of the contractor.
- Plan quality is poor. Contracts are missing items. Clarifications of notes dealing with the project are poor.
- Doing double the work (Computer and field notes). All plans not produced in-house.
- Uniform technology. "Computers are a tool not a toy." More structured in management in regards to change orders and accounting procedures.
- Not responding to field suggestions or alternatives.

- Not enough people available unable to get customers immediate assistance.
- More work being passed down from central to field offices. More work required with fewer staff and no increased pay adjustments.
- Supervisors do not handle problems (Not available).
- Errors on consultant plans.
- Demolition contracts.
- Changes in computer programs.
- Contractors sending safety meeting notes to office.
- Processing extra work orders.
- Getting time off.
- No support from upper management on field decisions.
- Landlord should be notified of tree removal prior to the starting of the project.
- Lack of permanent employees. Contractors are working without inspection.
- Less time spent on inspection and more time spent in the truck with the computer.
- Transition of new technology.

a) List concerns that have not been addressed in the survey.

- Delegation of work and responsibility is sporadic and confusing. Increase in micromanagement.
- The overall development process for construction projects is poor and needs immediate attention.
- With the new TEA money from the feds, will there be more money for construction inspection?
- Need more guidance about what needs inspection. Need to control time.
- Tech III classification study
- Replace Lotus with Excel. Too much work.
- Need CDRs and scanners for documents.
- "This survey is more targeted to construction aspects rather than office aspects."
- Construction contracts department does not deal with issues in a supportive manner.
- "Is someone keeping track of traffic control? (Non compliance)."
- "In my office the veteran employees run off the new better educated employees. Management allows it to happen."
- Lack of necessary personal to perform work. Additional work is being assigned to the RCE offices, however fewer employees are available. Overtime is supposed to be kept to a minimum, but with the workload is not possible. Budget allowances should be made for the some of the more recent projects that have been designated from Labor Day to Memorial Day with contractors requesting night work.
- New hires and the cool carriers program. People are needed now.
- Lack of leadership.
- Too much consulting
- Too much emphasis on teams. Need someone who is interested in what employees are accomplishing.
- "Communication is the biggest problem."
- Lack of proper training in survey and the new technology.
- Plans are still not good.

- Less inspection forces results in poor quality products. The contractor is being trusted too much.
- Plans not clear.
- Different offices handling inspection duties and priorities differently around the state. Things need to be done in a more uniform manner.
- Teams. "Sick of being forced to volunteer."
- Problems are causing contractor delays and the DOT money to fix these problems.
- "I hear talk about the construction study dealing with the possible upgrades in pay for AE-1 to CT3, but no one seems to know what the status is. The office of construction should give more timely, truthful answers. If they do not know or are not planning on doing anything, they need to say so."
- Teams.
- Escorts do not make good inspection vehicles. Small pick-ups would be better.
- Many people need more computer training not just on field book, but on overall computer usage.
- Incomplete information on consultant plans.
- "Position re-evaluations appear to be going nowhere."
- The direction of construction survey versus contract survey.
- Apprehension from senior employees about improvements in the system.
- Getting along with other employees.
- "I was not giving enough time to complete this survey."
- Contractors have little concern with safety and quality.
- "Contract survey does not understand the survey work."
- Timely communication is a problem.
- Lack of communication in the office TC and other areas.
- The following suggestion with regard to communication on projects was also offered:

I believe it was during the summer of 1997 that Dr. Jahren came to my job to talk about issues related to the inspection of DOT work. During our discussion I shared with him one of my greatest frustrations, trying to communicate with other inspectors and the construction residency management team. This problem continues to trouble me. Inspectors in the field do not have the tools to communicate within the project or from project to project. The use of cell phones and placing a phone in a job trailer or lab trailer has helped. The field office or field lab phone makes it possible to call the office and engineer or supervisor who has a cell phone. The cell phone works well for the project inspector who has it. The problem of contacting inspectors within a project or contacting another project remains. There are not enough two-way radios to go around and the radios are tied to the vehicles and the limits of our phone service are very obvious. Dr. Jahren's comment about communication was that other inspectors around the state told him that in the past when extra hands were needed, people just seemed to show up at the job. After some thought I have attributed "just showing up" to the practice of "wandering" on days when no work is being performed on your project. Driving around the countryside searching for a project in need of help is not an effective use of time and money.

John Smythe mentioned during the winter meetings that the work to be accomplished increases while the people to do the work remains static. The ability of our workforce to do more can happen with efficient communication used to move people to the work. Consider that many of our projects occur in corridors, bridges, grading, and paving occurring within a few miles. When one tries to find an inspector the old fashion way, chasing around the job searching in the various work locations, it is very easy to just miss the person you are searching for. At the end of the 20th century we are still wandering around hunting for people. Even if the two people have two way radios, both people have to be in their vehicles to hear the message. If the DOT is going to make the best use of the inspection work force, we have to find a way to move the people to the work.

The key to our situation is this, not every contractor works on every job every day. That seems simple doesn't it? The DOT does not currently staff each project to cover every possible construction activity every day. With better ways to talk with each other, could we move people from one project to another on a day to day or even hour to hour basis? I think with the changing work culture in the DOT, it would be safe to think that trust between resident engineers, field supervisors and project inspectors is increasing. It is possible that project inspectors could visit with each other, sharing people back and forth as needed without their supervisors having to approve each move. The key to this idea is being able to talk to each other in a timely fashion.

I am not naive enough to think that every inspector will have a cell phone, and after using one I am not sure I want to be that available to everyone. The new digital phone technology is suppose to have a level of service similar to two way radios that is less expensive than standard cell or digital phone service. Portable two-way radios that clip to the belt are handy but they seem to be pricey and have range and battery limitations. One of the old standbys is the pager. The pager has the advantage of being reasonably priced and the number of digits entered does allow for coded messages by number, (we can probably hire a teenager to consult on how to use coded messages). Project based phones or quick store phones have a fair availability to use in connection with a pager. There are pagers with the ability to send messages or receive written messages but these become about as pricey as cell phones.

If Project Development moves on this idea, it would be useful to carry the solution directly to the field inspectors. Everyone in the DOT can see who was assigned cell phones first in the organization. Would it be possible to establish that the inspectors have important work to do and equip them first to do something that needs doing now, instead of waiting a number of years because the inspectors are so far down the chain of command?

I think the pager has the greatest potential for being feasible and for having an immediate impact on the work situation. Equipping all the inspectors on a job (including summer help) with pagers would enhance DOT operations. The network of communication has expanded with the use of cell phones. The use of pagers could expand the network of communication at a cost much less then additional cell phones or additional employees.